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MONTANA TELECOMMUNICATIONS PROJECT REPORT

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Goals and Recommendations for the Use of Telecommunications in Montana

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MONTANA TELECOMMUNICATIONS PROJECT REPORT

The report and its recommendations were developed by the Montana Telecommunications Project Steering Committee. Committee activities were sponsored by the Montana Ambassadors with funding provided by the Montana Science and Technology Alliance.

In the preparation of this report, I consulted many written texts, as well as individuals, knowledgeable in the field. I have not attempted to make specific attribution of the ideas advanced in this paper. I wish, however, to acknowledge John Niles, President of Global Telematics for his guidance and consultation.

Comments and criticisms by the following people were especially helpful.

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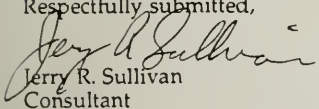
Many other individuals from both the public and private sectors shared their time and knowledge, for which they have my gratitude.

Respectfully submitted,



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EXECUTIVE SUMMARY
MONTANA TELECOMMUNICATIONS PROJECT REPORT
JANUARY 25, 1989

"Telecommunications are to the high-innovation economy what railroads, rivers, canals and highways were and are to the industrial world. They are the central channel through which most of this economy flows."

David Birch, Job Creation in America

The Montana Telecommunications Project was created in response to a presentation by Dr. David Birch to a Conference for Montana's Economic Future. The purpose of the Project was to prepare a report on the telecommunications infrastructure in Montana. The report offers goals and recommendations to focus efforts to use telecommunications and information for economic development in Montana.

The process of evaluating of telecommunications and its impact on Montana's economy should continue. Unlike other systems that affect economic development (road, water, railroad) telecommunications networks are under constant change and development. This report suggests a vehicle through which the evaluation process can continue.

Goals for the use of telecommunication and information for economic development in Montana are:

1. Montana should secure the greatest contribution to its economic well-being from telecommunications and information resources.

2. An adequate and perhaps superior telecommunications infrastructure must be in place to take full advantage of the information economy.

3. Montana must consider how modern telecommunications and information technologies can support rural economic development including quality of life.

4. The power of telecommunications to increase the quality and reduce the cost of education and health care in Montana is only beginning to be realized. Montana must take the initiative to use this technology to solve pressing problems in these areas.

To meet these objectives the following recommendations are made:

1. **Recommendation:** THAT BUSINESS AND GOVERNMENT LEADERS ESTABLISH A NON-PROFIT, PUBLIC-PRIVATE TELECOMMUNICATIONS DEVELOPMENT COUNCIL (TDC).

2. **Recommendation:** THAT THE TELECOMMUNICATIONS DEVELOPMENT COUNCIL OFFER COMMENTS TO THE PUBLIC SERVICE COMMISSION ON THE ECONOMIC DEVELOPMENT IMPACTS OF ALL PENDING TELECOMMUNICATIONS REGULATORY DECISIONS, INCLUDING MODERNIZATION OF SWITCHES.

3. **Recommendation:** THAT THE GOVERNOR OF MONTANA WITH ASSISTANCE FROM THE STATE UNIVERSITY REGENTS AND IN COOPERATION WITH THE GOVERNORS OF SURROUNDING STATES, PROVIDE LEADERSHIP IN THE ESTABLISHMENT AND OPERATION OF A NEW RESEARCH AND DEVELOPMENT (R&D) CENTER.

4. **Recommendation:** THAT THE MONTANA DEPARTMENT OF NATURAL RESOURCES AND CONSERVATION (DNRC) APPOINT A TASK FORCE OF GOVERNMENT, PRIVATE SECTOR AND UNIVERSITY REPRESENTATIVES TO ASSESS THE OPPORTUNITIES FOR INFORMATION-BASED IMPROVEMENTS AVAILABLE TO THE STATE.

5. Recommendation: THAT U.S. WEST, AS WELL AS OTHER TELECOMMUNICATIONS PROVIDERS IN MONTANA (REGULATED OR UNREGULATED) RE-DEPLOY A PORTION OF THEIR MARKETING AND CUSTOMER SERVICE RESOURCES INTO A SERIES OF INDUSTRY SUPPORT CENTERS, EACH OF WHICH WOULD SPECIALIZE IN ON INDUSTRY, SUCH AS FARMING OR MINING.

6. Recommendation: THAT THE DEPARTMENT OF COMMERCE REVIEW THE ECONOMIC AND PROGRAMMATIC FEASIBILITY OF SUPPORTING A TELEPHONE SERVICE FOR ECONOMIC DEVELOPMENT ACTIVITIES INCLUDING SPECIFICALLY LINKING MONTANA TOURISM SERVICES TO OUT-OF-STATE MARKETS.

7. Recommendation: THAT THE TDC DETERMINE THE VALUE OF ADVANCED TELECOMMUNICATIONS AND INFORMATION SERVICES APPLICATIONS IN INDUSTRIES TARGETED FOR DEVELOPMENT BY ECONOMIC DEVELOPMENT OFFICIALS, IDENTIFY BARRIERS TO REALIZING THAT VALUE, AND PROPOSE ACTION BY THE TELECOMMUNICATIONS INDUSTRY AND GOVERNMENT TO OVERCOME THOSE BARRIERS.

8. Recommendation: THAT THE SUPERINTENDENT OF PUBLIC INSTRUCTION REVIEW THE ECONOMIC AND PROGRAMMATIC FEASIBILITY OF LOCAL EDUCATIONAL SERVICE DISTRICTS OR BOARDS OF COOPERATIVE EDUCATIONAL SERVICES AS A MEANS TO UTILIZE TELECOMMUNICATION TECHNOLOGIES FOR K-12 INSTRUCTION, STAFF DEVELOPMENT AND INFORMATION TRANSFER.

9. Recommendation: THAT THE BOARD OF REGENTS APPOINT A TASK FORCE TO DEFINE OPPORTUNITIES FOR APPLYING TELECOMMUNICATIONS TO RAISE THE PRODUCTIVITY OF THE UNIVERSITY SYSTEM'S ADMINISTRATIVE FUNCTIONS. THE TASK FORCE SHOULD IDENTIFY CERTAIN PROGRAMS AND LINKAGES THAT COULD BE UTILIZED BY COMMERCIAL INTERESTS IN THE STATE TO PROMOTE ECONOMIC DEVELOPMENT.

10. Recommendation: THAT THE HJR 58 NETWORK DEVELOPMENT BE TAKEN AS AN OPPORTUNITY TO EXTEND TO THE GREATEST EXTENT POSSIBLE MONTANA'S EXISTING PRIVATELY PROVIDED, INFRASTRUCTURE AND
SERVICES.

11. Recommendation: THAT THE GOVERNOR ESTABLISH AN INTERAGENCY TASK FORCE INCLUDING ALL STATE DEPARTMENTS AND OFFICES TO REVIEW ADDITIONAL OPPORTUNITIES FOR INCREASING STATE GOVERNMENT'S EFFICIENCY AND EFFECTIVENESS THROUGH TELECOMMUNICATIONS AND INFORMATION SERVICES.

12. Recommendation: THAT THE DEPARTMENT OF COMMERCE SUPPORT AN ELECTRONIC INFORMATION SERVICE PROVIDING COMMUNICATIONS AND DATABASE RETRIEVAL FOR COMMUNITY-LEVEL ECONOMIC DEVELOPMENT AGENCIES.

NOTE: THESE RECOMMENDATIONS WERE APPROVED BY A CONSENSES OF THE STEERING COMMITTEE. THE TEXT CONTAINS DISCUSSIONS OF OTHER ISSUSES FROM WHICH RECOMMENDATIONS WERE DRAWN BUT DID NOT RECEIVE THE MAJORITY SUPPORT OF THE COMMITTEE.

This paper describes the relationship between advanced telecommunications and Montana's economic development. The Montana Ambassadors commissioned the Montana Telecommunications Project to provide a study of the state's telecommunications infrastructure. The project was guided by a steering committee that began meeting informally in May 1988. At several meetings held from October through January 1989, formal presentations were made by experts in both public and private telecommunications.

The objective of the study was to develop a plan through which Montana could better utilize its present telecommunications infrastructure and enhance that network to help achieve economic development goals. The goals for using telecommunications and information management for economic development in Montana are:

- Montana should secure the greatest contribution to its economic well-being from telecommunications and information resources.

- Montana must have an adequate, if not superior, telecommunications infrastructure to take full advantage of the information economy.

- Montana must consider how modern telecommunications and information technologies can support rural economic development while maintaining quality of life.

- Montana education and health care leaders must consider ways to improve the delivery of their services through telecommunications and information applications.

I. THE PAST, PRESENT AND FUTURE OF MONTANA'S ECONOMY

The history of Montana's economic development parallels the rise and fall of the state's key industries—mining, agriculture and timber. Gold and silver seekers brought in the first notable development of the Montana territory. With the discovery and subsequent exploitation of copper came more permanent development. Copper mining employed thousands of people in Montana. The copper barons controlled newspapers, legislatures and government officials. Out-of-state interests not committed to Montana's long-term welfare controlled the profits from the mining operations. The state's economy was dominated by metal prices and interests principally located in New York. As mining declined and no longer provided a stable employment base, Montana's leadership began to consider other ways to develop the state's economy.

A central characteristic of international economic evolution is the growing need for communications and information-processing. Whereas in earlier eras the economy was raw materials-intensive, labor-intensive, and often energy-intensive, the key today is information-intensive. There are two forces at work in this trend:

- First, manufacturing is becoming more knowledge intensive, as the technology (or know-how) of products, manufacturing processes, and management becomes ever more complex. Knowledge is information that has been organized to have meaning. Product development is the transformation of research and development, (knowledge), into goods and services for the market. The flow of information is critical to modern manufacturing.

- Second, the complexity of manufacturing is paralleled by a growing complexity in everyday life and work. The economic response of the market economy is an ever-growing array of services available to consumers and producers. As in manufacturing, the life-blood of services is information: information about markets, about processes and procedures, about administration, about customers and employees.

The Service Economy

M.I.T. economist Dr. David Birch conducts ongoing studies of the developing economy in the United States. On a visit to Montana in 1986, he described the evolving service-based economy as a "thoughtware economy, an economy based on thinking and innovation rather than on muscles and dexterity." He pointed out that it is necessary to distinguish between the creation and the application of technology. Most growth in the information economy comes from the application of technology in businesses where the product is computer software, finance, education, data bases, insurance, health care, consultants and telecommunications.

Between 1960 and 1985, service jobs in the U.S. economy accounted for 32 million of the 41 million new jobs created. In comparison, during the same 25-year period, resource-based employment dropped by 2 million and manufacturing increased by 2.6 million, a virtual wash. While employment in Montana has grown at a modest 2.5 percent annually since 1970, service jobs have grown at an almost 8 percent rate. Nationally, service employment has grown an average of 4.1 percent over the last quarter century.

Exhibit 1 shows the increasing influence of service employment on the Montana economy. From 1970 to 1985, Montana's employment increased by 42,000 jobs. Of that total, service employment represented 80.6%. During the same period, agriculture, mining and forestry lost 1,900 positions. Manufacturing lost another 1,100. In 1970, Montana's resource based employment represented 44.3 percent of total employment in the state, but dropped to 33.6 percent by 1985. Service employment during that same period increased from 17.6 percent of total employment to 30.5 percent. WHEN GOVERNMENT EMPLOYMENT IS INCLUDED, SERVICE INDUSTRIES IN MONTANA REPRESENT OVER 65 PERCENT OF TOTAL EMPLOYMENT!

Exhibit 1
Montana Employment by Sector, 1970-1985

	1970 Jobs (000)	Percent of total	1985 Jobs (000)	Percent of total
Resources	47.1	28.8	45.2	21.9
Manufacturing	25.3	15.5	24.2	11.7
Services	28.8	17.6	62.9	30.5
Government	62.6	38.1	73.8	35.9
Total	**163.8**	**100.0**	**206.1**	**100.0**

Source: U.S. Bureau of Labor Statistics

It is important to understand that, in the modern economy, the lines between manufacturing and services are blurred. Is McDonald's a fast-food service or a chain of food-processing factories? Is a software package that organizes and computes income taxes a manufactured product or a tax-preparation service? Are video recorders a new facet of the entertainment service industry or goods? Many so-called " manufacturing jobs" today have all the characteristics of service jobs.

Economic Development

Economic development means explicit action by state and local government and other public interests, to cause appropriate growth and other positive changes in economic conditions. An example of positive economic change not necessarily based on growth, is the situation of a region losing some industries and population. This initial decline is followed by the emergence of a different mix of businesses yielding higher average wages, lower unemployment and a more attractive quality of life. The revitalization of a region following the departure of a large factory, mine or military base is an example of this kind of development. Public economic development actions can focus on fighting and delaying changes in the local industry mix, or on developing and supporting alternative mixtures. There is ample latitude for public choice in the course of action to be decided upon.

The development of Montana's economy falls to the market-driven interests of the private sector and the politically driven interests of the public sector. The socio-economic conditions in Montana suggest that an

economic development effort based on the following foundations would enjoy widespread popular support:

- Provision of infrastructure, the physical facilities that support the delivery of goods and services. Infrastructure gaps that inhibit economic growth need to be recognized and addressed; existing infrastructure needs to be maintained and, if necessary, upgraded.

- Preservation of the natural environment, one of Montana's major assets.

- Support and enhancement of Montana's existing basic industries — tourism, farming, ranching, mining, timber, petroleum and related processing industries — to the degree they are economically viable in national and world markets.

- Diversification beyond basic industries, to create jobs that fit the skills of residents and provide them with employment.

- An emphasis on the incubation, nurturance and support of small business, with the goals of significant local job creation and seeing at least a handful of small businesses grow to national or international market recognition.

- High-quality public education — elementary through college -as an essential part of a good environment for raising children, and to allow people to gain the skills and attitudes necessary for productive employment or entrepreneurship. Public education is now recognized nationwide as the foundation of economic progress.

- Effective and efficient government to provide the services, protection and fairness all citizens—consumers, employees managers and business owners—depend upon and expect in return for taxes.

II. THE ROLE OF TELECOMMUNICATIONS IN MONTANA'S ECONOMY

Throughout the modern world, a nation's telecommunications network has become as important to the economy as transportation, water supply, electric power and waste disposal infrastructures. In the Third World, the construction of telecommunications infrastructure is recognized as a key developmental step. The existence of a modern telecommunications network does not of itself cause economic development to take place, but it does permit that development to occur. Telecommunications is necessary, but not sufficient; transportation, power, labor and capital remain the cornerstones of economic development. But, as the economy becomes more information-intensive, the relative importance of telecommunications is growing.

The level of Montana's telecommunications development governs how our citizens do business with each other, with the rest of the nation and with the world.

Advanced telecommunications have the potential to strengthen and support the cornerstones of economic development activity in Montana:

- Advanced telecommunications—capable of carrying computer data and images as well as voice — is now as important to the economy as the traditional infrastructure for power, water, transportation and waste management.

- Montana's economic disadvantages related to geographic isolation can be overcome through application of appropriate telecommunications technologies.

- Preserving environmental quality requires an information intensive process.

- The revitalization of basic industries can be supported through advanced telecommunications.

- Diversification of the economy into information intensive industries can be supported through advanced telecommunications.

- Entrepreneurial people and small business proprietors can be supported through advanced telecommunications.

- Education — the foundation for economic development-can be improved through telecommunications applications.

- Effective and efficient government is facilitated through the use of telecommunications.

This paper will describe how telecommunications supports these seven cornerstones of economic development.

III. PUBLIC TELECOMMUNICATIONS INFRASTRUCTURE

Background

The public telecommunications infrastructure, or network, consists of the physical facilities that support telecommunications services and applications. Its services are available to any household or organization. The network is provided and operated by private companies operating under federal, state and local government regulation.

In recent years, the public telecommunications network has evolved beyond the ubiquitous telephone network which allows Montanans to talk with a next door neighbor or someone in a distant hemisphere. Technological evolution now allows computer data and image communications over that telephone network as well. Facsimile machines for document transmission, telephones incorporating still-image TV cameras, and computers with data modems can be attached to, and used with, any telephone line in Montana. This paper uses the term "telecommunications" rather than "telephone" to reflect the present and emerging capabilities of the system.

The technological evolution of the public telecommunications network promises to allow larger quantities of information to be sent in shorter time periods, a development characterized as "expanding bandwidth." The telecommunications "information pipe" is becoming wider. This is being accomplished through improvements in the network, or through improvements in the devices which attach to the network. To the user, this trend means better quality in sound and image transmission, and faster transmission of data files.

Montana's telecommunications industry includes both regulated and unregulated companies. Among regulated companies are U.S. West, A.T.&T., G.T.E., and five small independent companies. The unregulated companies include Intermountain Digital Network (Montana Power's nonutility subsidiary), U.S. Sprint, Burlington Northern and seven cooperatives. The State Telephone Network serves the needs of state government in 13 communities across Montana.

Telecommunications in the public network are categorized as exchange or interexchange in nature. Local exchange companies provide local distribution and access to intrastate and interstate toll service. In Montana, U.S. West is the primary regulated exchange carrier, controlling some 88 percent of the access lines. Small regulated companies and nonregulated cooperatives provide the balance of local exchange service.

Telecommunications infrastructure has three main elements: access lines, central offices and interexchange connections. Access lines connect the homes and offices to central switching offices. The access lines are cables located either on utility poles or underground. The central offices relay and process calls to other central offices in Montana, or to long- distance switches, called points of presence. Long-distance switches, maintained by companies like A.T.&T., M.C.I., and U.S. Sprint, are connected nationwide through varied connecting technologies such as fiber optic cable and microwave.

The telecommunications inventory of Montana presented in Exhibit 2 includes the major regulated and unregulated companies, with the exception of G.T.E., which serves a small portion of the northwestern part of Montana. U.S. West has the greatest number of access lines (customer phones) in Montana, with about 290,000 lines or 88 percent of the total. Only 8 percent of U.S. West's central office switches in Montana are digital. Since these offices are in the more populated areas, an estimated 42 percent of U.S. West's customers are served by digital switches.

Exhibit 2
Telecommunications Inventory, 1988

Access lines	Number	Percent of Total
Cooperatives & Independent Co.	73,951	20%
U.S. West	290,000	80%
Total	**363,951**	**100%**
Equal Access	174,300 (1)	53%
Central Offices		
Digital	113	44%
Analog	144	56%
Total	**257**	**100%**
	Miles	
Fiber Optic Cable	1345 (2)	6%
Digital Radio	1985	8%
Digital T-Carrier	15511	65%
Analog Radio	3037	13%
Other Analog	1778	8%
Total	**23656**	**100%**

Source: Survey of U.S. West, U.S. Sprint, Cooperatives and Independent Cos. Montana Telecommunications Project Oct. 1988 (1) Equal Access is estimated based upon FCC Equal Access Conversions Tables Dec. 1987 and Montana Telecommunications Project Survey Oct. 1988 (2) Estimates: U.S. West 300 mi., U.S. Sprint 700 mi., Others 345 mi.

Access lines

Access lines carry calls from subscribers to central office switching equipment. Montana has over 330,000 access lines to residential and business subscribers. Exhibit 2 describes the number and percent of access lines controlled by the phone companies in Montana.

Although a rural, sparsely populated state, Montana has a high level of single-party access lines statewide. This is important because of the high quality of service and access to features they provide. Between 1982 and 1986, U.S. West undertook the Rural Telephone Improvement Program to provide single-party service to its rural customers. The Montana Public Service Commission allowed rate-of-return incentives to help offset the cost of this program.

The high level of one-party service in Montana is a plus for the economy.

Interexchange connections

Additional switching offices and cable connections called trunk link exchanges. Trunks carry the telecommunications traffic that goes between cities. Calls between cities and other exchange offices are routed over inter-exchange trunks connected to inter-exchange offices. These trunks naturally carry a large volume of calls, and are increasingly made of fiber optic cable.

While copper wire carries information by electromagnetic waves, fiber cable carries information by light. Fiber cable consists of several strands of super-pure glass or plastic, bundled together, and has greater capacity than copper wire. A pair of twisted copper wires can handle a maximum of 96 simultaneous conversations. One pair of fiber strands can handle over 6,000 simultaneous conversations. Clear transmission of data is greatly enhanced with fiber cable, because the signal does not require the frequent electronic boost copper wire needs. THE OPTIMUM AVAILABLE TECHNOLOGY FOR COMMUNICATIONS IS FIBER CABLE WITH DIGITAL SWITCHES.

The phone companies have approximately 1300 miles of fiber cable in Montana. Of those, U.S. Sprint has deployed about 700 miles.

Montana's network has several locations that are served by fiber cable. U.S. West has deployed fiber connecting Bozeman to Billings and Helena to Missoula, totaling 265 miles. The unregulated companies have laid about 300 miles of fiber connecting towns such as Glentana to Westby in northeast Montana and Lincoln to Canyon Creek in the west.

Although Montana has only one long-distance area code, the state is divided east and west into two separate service areas, between which a call is routed via a long distance company. Federal regulations prohibit U.S. West and the other local exchange carriers from connecting calls between these two areas.

Each long-distance carrier has what amounts to a central office in each of the two areas, typically in Helena and Billings. These switch centers are called points of presence, and are the physical points at which long-distance calls connect to the long- distance lines.

A.T.&T.'s two switching offices in Montana employ analog type switches. The company has plans to upgrade these switches by 1990. Such changes will reduce the decibel loss experienced by firms operating in Montana which use A.T.&T. as their long-distance carrier.

Long-distance carrier U.S. Sprint crosses the state with a fiber cable that runs from Minneapolis, to Glendive and on to Sand Point, Idaho, Spokane and Seattle. Access points to this cable are at the points of presence in Helena and Billings. The company has indicated that it would consider another point of presence in Missoula when economic conditions warrant.

The deployment of fiber optic cable for inter-exchange connections is a plus for the economy of Montana. In addition to allowing high speed, high quality voice and data connections, fiber paths also support the transmission of high definition, full motion, two-way video.

Central offices

Central offices provide first and last switching for the calls that flow through any of the state's 330,000 access lines. A total of 242 central offices serve Montana users with a variety of equipment that ranges from outdated step-by-step analog systems to state-of-the-art digital systems. Analog switches represent about 59 percent of the surveyed offices while 41 percent have digital switches. The cooperatives' and independent companies' central offices are mainly digital (84.5 percent), while U.S. West's are not (8.3 percent).

Digital switching is important for a number of reasons. First, it lowers the phone companies' operation and maintenance costs. Lower costs are an important contributor to lower service rates for telecommunications users. Second, digital switching provides the ability to connect customers with vertical services, described on page 13. Third, digital switching facilitates access to alternative long-distance providers.

Because U.S. West is the dominant service provider in Montana, its investment in digital switches is very important to the state. As of September 1, 1988, U.S. West estimates that 42 percent of its customers are served by digital switches. These customers generally live in the Montana cities along the population crescent—Billings, Bozeman, Helena, Great Falls and Missoula.

Less populated Montana towns are not keeping pace with the cities in acquiring digital switches. The ability of a small business dependent on rapid transmission of data over phone lines to locate in rural areas is limited. For example, Clancy, a small community close to Helena, has an analog switch. A data-intensive home business could locate in Helena, but would be severely restricted if it moved to Clancy 15 miles away.

Advance Business Computing (A.B.C.) Corp. started in Helena in 1978. The firm develops retail-store software and provides custom programming services for IBM personal computers. This company's customers are mostly distant, whether in-or out-of-state.

Because of its location in Montana, the firm experiences data transmission slowdowns. The present standard for data communications from a personal computer over ordinary phone lines is 2400 baud, which means roughly 240 characters (individual letters or numbers) per second. An ordinary phone line with analog

switches in its path will generally tolerate the rate of 1200 baud, or roughly 120 characters per second. Due to the number of analog switches still remaining in communications from and within Montana, A.B.C. Corp. is limited to this slower rate in many calls from Montana. In transmitting to the northeastern part of Montana, this firm experiences a drop in speed to a now unacceptable standard, 300 baud or 30 characters per second, one eighth the present standard speed of 2400 baud. IN PRACTICE, BECAUSE OF THE STEP-DOWN FROM 1200 TO 300 BAUD, A.B.C. CORP. MANAGERS SUFFER AN INCREASE IN TYPICAL DATA TRANSMISSION TIME FROM 10 MINUTES TO 30 MINUTES, A TRIPLING OF LONG-DISTANCE TIME AND COST.

Vertical services

Vertical services include E911 service, call forwarding, call waiting, and speed calling. New features that become available through the increased capabilities of digital switches may not be available through an analog system. Vertical services are important. The E911 service helps protect life and property by identifying the caller and his location without the caller needing to make that identification. The call is automatically traced and the nearest emergency response team is notified immediately.

Call forwarding, call waiting and speed calling make the phone a more usable tool for business and professional people. The call waiting feature allows an individual firm to answer calls without the expense of having more than one line. Call forwarding allows flexibility to business people by not restricting their location during the day. These services replace the need for full-time secretarial or answering services, and enhance the business's opportunity to succeed.

Vertical services that will be available in the future include one-number access for users with computers to reach information services using modems. Such access is called a "gateway."

Equal access to long distance services

Equal access enables Montana customers to select between the long-distance carriers for routing toll calls out of state and to the other half of the state. Long-distance carriers include A.T.&T., M.C.I., and U.S. Sprint. This ability to choose is available only to customers served by certain analog switches or by digital switches. About 53 percent of Montana users today enjoy equal access. With equal access, the customer need dial only a single digit and the local office codes each call for routing to the selected long-distance carrier. Without equal access, the customer must dial up to an unrealistic 36 digits to use any long-distance provider other than A.T.&T.

Having a choice of long-distance providers is an important attribute of the local business climate. Being able to choose provides the opportunity to seek a significant price advantage, in addition to possible advantages in quality of transmission and service support. Telecommunications managers in many firms prefer to select a different long-distance carrier depending on where an employee is calling for a particular call. The opportunity to choose also has symbolic meaning in what it projects about the quality of business services in Montana. Equal access is certainly critical for communications-intensive businesses such as Metropolitan Analysis and Research of Missoula, which must be able to negotiate the most advantageous communications services.

Exhibit 3 displays equal access conversion for the Bell Operating Companies nationwide as of December 1987. The table shows that on average, the Bell regional companies have converted 84.2 percent of their lines to provide equal access. The U.S. West region on average is 80.6 percent converted to equal access. MONTANA'S 48.9 PERCENT IS FAR BEHIND THE AVERAGE AND LAST OF THE 14 STATES IN THE U.S. WEST REGION.

Exhibit 3
Equal Access Conversions U.S. West December 1987

State	Total	Converted	Percent Converted
Arizona	1,644.4	1,461.8	88.9
Colorado	1,723.8	1,451.7	84.2
Utah	670.0	553.9	82.7
Idaho	316.0	243.3	77.0
New Mexico	541.3	383.4	70.8
Wyoming	210.2	113.0	53.7
Montana	293.4	143.5	48.9
Total	**5,399.1**	**4,350.6**	**80.6**
Total all Regional Bell Cos.	96,581.0	81,302.0	84.2

Source: F.C.C.
As of late 1988, an estimated 58 percent of Montana subscribers have equal access. Equal access is limited to the urban areas because other long-distance carriers are not willing to offer the service to rural areas.

Exhibit 4 displays the Bell Operating Companies projected equal access conversions. It is projected that by 1990, U.S. West will have equal access on 60.2 percent of their lines. The lowest level of equal access is Wyoming with 54.7% projected by 1990.

Exhibit 4
U.S. West Equal Access Conversion Projections

	1988	1989	1990
Arizona	95.3	96.4	96.5
Idaho	87.1	91.5	94.9
Utah	92.4	92.5	92.6
Colorado	91.1	91.2	91.9
New Mexico	85.0	86.9	87.1
Montana	60.0	60.1	60.2
Wyoming	54.3	54.6	54.7
Total	**88.7**	**89.6**	**90.2**
Total all Regional Bell Cos.	91.8	94.6	96.6

Source: F.C.C.

Equal access is established at the central office in one of two ways. The central office can simply use an adjunct machine with the existing analog switch that allows the choice, or the central office can be changed to digital technology. Both methods accomplish the objective; however, the enhanced analog switch limits the services available with the digital switch conversion, and perpetuates data transmission service that is of substandard quality.

Seizing an opportunity in Butte

The role of politics and community pressure in central office digitization is illustrated by the experience of Butte, Montana.

Butte has in the recent past suffered great economic difficulties. In the early 1980s the Atlantic Richfield Company closed its Butte mining operations, laying off hundreds of miners and other personnel in the community. The town's population decreased and the business community was adversely affected. Businesses lost money and were forced to close, causing further hardship.

Butte's uptown central office was not scheduled to be converted to digital switching until 1993 or 1994.

Community leaders, including the local government's Chief Executive determined that, if Butte was to seriously compete for certain economic development opportunities, it must have the newest technology in place. The old analog system would be a drag on the community.

The city made a proposal to U.S. West to advance the conversion date for the digital switch in Butte. U.S. West agreed to advance the date, and the city in exchange agreed to build a new facility for the company. U.S. West will turn over its present building to the community to be used as a library.

State government regulation

As in other states, Montana's public telecommunications network, including central offices, is defined by the providers investment decisions, which are based on customer demand, availability and cost-effectiveness of technology, and on regulatory constraints. The State of Montana has important leverage over the development of telecommunications through the legislative and regulatory processes. A regulatory process exists in every state to protect consumers from potential abuse of the monopoly power of public utilities, such as local phone companies. In the absence of regulation, the potential abuses that a lone service provider could inflict on users without alternatives include unjustified high prices, poor quality service, and discrimination against certain categories of customer. In the information-based economy, these issues need to be analyzed in light of economic development policy. For example, if small, export-oriented food processing business located in rural communities emerge as a crucial element in the revitalization of Montana's economy, then the regulatory process should be fine tuned to recognize the special telecommunications requirements of such businesses.

In 1985, the Montana Legislature enacted the "Montana Telecommunications Act." Along with declaring that the policy of the state was to maintain universal basic telecommunications service at affordable rates, the Act encourages competition for two purposes. One purpose is to allow access in Montana to rapid advances in telecommunications technology, and the other is to provide for the orderly transition from a regulated telecommunications industry to a competitive market environment.

The Montana Telecommunications Act provides the regulatory framework to promote competition and to ultimately free the industry from regulatory constraints. Since 1985, the industry has seen the beginnings of competition. For example, Montana Power Company's subsidiary Intermountain Digital Network, has become a provider of private line or point to point service to business and government.

Montana's Public Service Commission is an elected body whose responsibilities include the regulation of telephone utilities. This body responds to the demand for universal service as outlined in the Montana Telecommunications Act of 1985. The PSC must weigh price against universal service and the inclusion of the cost of upgrading in the rate base.

Public Policy for Telecommunications

1. Recommendation: THAT BUSINESS AND GOVERNMENT LEADERS ESTABLISH A NON-PROFIT, PUBLIC-PRIVATE TELECOMMUNICATIONS DEVELOPMENT COUNCIL (TDC).

The council would focus on the continuing, appropriate development of a public telecommunications network in Montana that supports economic development and quality of life of the state. A prime objective would be to monitor and improve Montana's level of telecommunications development relative to the state of the art, and the level of other western states.

The TDC would be comprised of Montana citizens from all sectors of the economy and regions of the state. Those who provide and use telecommunications — particularly extensive users — should be represented on the Council. Funding could come from a mixture of public and private sources. The TDC would establish a research agenda and review the policy-oriented research produced by a small paid staff. The TDC would make knowledge-based recommendations for action by state and local government, public utilities and others.

Goals and objectives of the TDC may be accomplished through formation of the cooperative envisioned in the HJR 58 Report to the 51st Legislature. Whatever entity is formed for the purposes described above, should take advantage of input from the private sector telecommunications users and constituents. The involvement of such private interests should be encouraged and facilitated by the Montana Science and Technology Alliance and the Montana Ambassadors.

2. Recommendation: THAT THE TELECOMMUNICATIONS DEVELOPMENT COUNCIL OFFER COMMENTS TO THE PUBLIC SERVICE COMMISSION ON THE ECONOMIC DEVELOPMENT IMPACTS OF ALL PENDING TELECOMMUNICATIONS REGULATORY DECISIONS, INCLUDING MODERNIZATION OF SWITCHES.

Modernization must take into consideration technological advances. The development of new switches, for instance, may delay a plan's implementation until those switches are available. Modernization plans must consider other factors such as growth, customer demand, requirements analysis, engineering studies and cost benefit analysis. The plan should provide goals that are realistic under projected economic conditions. The dilemma of the demand for low cost universal service on the one hand, and the need for technological upgrading on the other, is central to Montana's present telecommunications network. The resolution of this dilemma must include a consideration of the impact on economic development.

According to testimony offered to the Public Service Commission, U.S. West does not have a long-range construction plan. Plans are developed annually for the coming two-year period. These plans serve as an investment guide, but major projects must receive specific approval before they are funded. After the Butte main office is upgraded in 1989, there are no other local switching facilities upgrades planned for Montana. There are other mid-sized offices that would be considered for upgrading if financial conditions warranted.

U.S. West claims that a reasonable rate of return is appropriate and necessary just to cover the significant investment already made in Montana. According to that company's testimony, recent PSC decisions to reduce revenues in Montana, plus years of inadequate earnings have reduced funds that could have helped finance additional investment in this state.

Regulators need to carefully weigh arguments about a lack of funds for modernization against the financial advantages that accrue to U.S. West from the lower costs of operating and maintaining digital switches. Such equipment, which has been placed in sealed underground vaults in some areas of the country, is more resilient to the effects of weather and dust. Diagnostic and reprogramming work can often be performed on these switches remotely through telecommunicated signals, so company personnel do not have to visit switches as often. Also, because of the additional services that can be offered with digital equipment, U.S. West has new revenue opportunities that speed up the payback on investment costs. U.S. West claims that further modernization in Montana can only be justified with higher rates for existing services to all users should be critically analyzed by the PSC.

Research and Development

The Telecommunications Development Council would work for the best interests of Montana. At the same time, the TDC would probably develop research questions of such broad scope and widespread interest that they would best be addressed with resources from several states.

.3. Recommendation: THAT THE GOVERNOR OF MONTANA, WITH ASSISTANCE FROM THE STATE UNIVERSITY REGENTS AND IN COOPERATION WITH THE GOVERNORS OF SURROUNDING STATES, PROVIDE LEADERSHIP IN THE ESTABLISHMENT AND OPERATION OF A NEW RESEARCH AND DEVELOPMENT (R&D) CENTER.

This new center would conduct R & D on the linkages between advanced telecommunications and economic development in regions of low population density. Research carried out to date bears either an academic or urban focus that is not directly relevant to policy improvement in low-density, largely rural states like Montana. There is an opportunity to establish such a center in a location where the residents live with the problems, opportunities and issues to be addressed. A multi-state approach would spread the cost of policy-oriented research and development to a number of other states besides Montana. States that share similar circumstances to Montana that could be invited to join include North Dakota, South Dakota, Wyoming, Idaho, Washington, and Oregon. A possible name is the North-Northwest Telecommunications Research Institute (NWTRI).

There may be some economies of scale possible if the staffs, offices and administration of the Montana-focused Telecommunications Development Council, and the regionally focused Telecommunications Research Institute were shared or coordinated. The two organizations could be jointly located in and affiliated with the Montana State University System. The Telecommunications Research Institute should seek cooperative

relationships with such regional and national research organizations as:

- the Center for the New West, Denver, an alliance for western prosperity that includes leaders of business, government, education and other public interest groups in 18 western states, including Montana. A non-profit organization established with major U.S. West funding.

- the Northwest Policy Center, University of Washington, Seattle, which carries out policy research, designs and evaluates policy alternatives, and fosters information exchange among those seeking to meet the economic challenges facing the five northwestern states including Montana.

- the Berkeley Roundtable on the International Economy, University of California, Berkley, a research group specializing in policy oriented studies of the interaction of high-technology development and the international economy.

- the International Center for Information Technologies, Washington, D.C., a research and education organization established by M.C.I. Communications Corporation to help officials in large firms and organizations plan for, manage and use information technologies.

IV. PRESERVATION OF THE NATURAL ENVIRONMENT

If preservation of Montana's natural environment is to be one of the foundations of economic development in the state, the government and private sector agencies collectively responsible for managing the environment should be aware of the potential for productivity improvement through advanced telecommunications applications.

4. Recommendation: THAT THE MONTANA DEPARTMENT OF NATURAL RESOURCES AND CONSERVATION (DNRC) APPOINT A TASK FORCE OF GOVERNMENT, PRIVATE SECTOR AND UNIVERSITY REPRESENTATIVES TO ASSESS THE OPPORTUNITIES FOR INFORMATION-BASED IMPROVEMENTS AVAILABLE TO THE STATE. Areas of opportunity that should be investigated include:

- Computer-accessible electronic bulletin boards (videotex) or push-button phone access (audiotex) by Montana citizens and businesses to environmental information.

- Data from remote monitoring of weather, water quality and levels, snow pack, and air quality could be assembled, analyzed, andprocessed for wider dissemination and use.

For the past several years Montana has suffered a drought. Presently, there is no central source of information concerning snow pack, river flows and demand. The Department of Natural Resources and Conservation could centralize information concerning these issues from sources such as the Soil and Conservation Service (snow pack) and USGS (river flow), and provide easy access.

A central data base on water would go a long way to reducing the effects of drought. Profiles of drainages would assure water users that there was an adequate supply. This could reduce the over watering fear of scarcity brings. Choice of crop could also be affected by knowing that there is inadequate water to support one kind of crop, but sufficient for another.

DNRC could, for example, set up 24-hour, 800-number access to any databases developed. This would allow farmers, ranchers and others to access the databases during hours that suit their work schedule.

V. REVITALIZATION OF BASIC INDUSTRIES

A likely mainstay of Montana's economic development program is support for the retention and expansion of traditional, basic industries, such as mining, farming, ranching and forestry. The maintenance of these industries is supported by telecommunications. Telecommunications allows these firms to control inventories and provides access to data bases, for market information, necessary to be competitive in the world economy. Telecommunications facilitates joint ventures between firms, private/public cooperation, delivery

of technical assistance to owners and managers from any source, delivery of worker training from colleges and other sources, and outreach to markets worldwide.

5. Recommendation: THAT U.S. WEST, AS WELL AS OTHER TELECOMMUNICATIONS PROVIDERS IN MONTANA (REGULATED OR UNREGULATED) RE-DEPLOY A PORTION OF THEIR MARKETING AND CUSTOMER SERVICE RESOURCES INTO A SERIES OF INDUSTRY SUPPORT CENTERS, EACH OF WHICH WOULD SPECIALIZE IN AN INDUSTRY, SUCH AS FARMING OR MINING.

These centers would be designed to raise the level of business management awareness and the utilization of available telecommunications resources. The centers could be operated in cooperation with trade associations or professional groups. They could conduct an ongoing needs assessment in the industries in which they specialize in order to determine what assistance advanced telecommunications could provide.

6. Recommendation: THAT THE DEPARTMENT OF COMMERCE REVIEW THE ECONOMIC AND PROGRAMMATIC FEASIBILITY OF SUPPORTING A TELEPHONE RESERVATION SERVICE TO LINK MONTANA TOURISM SERVICES TO OUT-OF-STATE MARKETS.

The objective is to provide one-stop shopping for prospective visitors from Seattle, Portland, Denver and Salt Lake City, and to transform small, fragmented, individual Montana providers into a system of multi-center "resorts." This concept applies to dude ranches, ski areas and bed-and-breakfast inns, and has the potential to make Montana tourism "big" without relying on large resort centers. Small scale, widely scattered tourism development, accessible through telecommunications, may be more in keeping with the preservation of Montana's natural environment and way of life than the development of mega-resorts.

Commerce is encouraged to look to other state-wide services that could be linked in a similar manner. For example, centralized data base for economic development could be maintained and supported by the department by providing 800-number access.

VI. DIVERSIFICATION OF THE ECONOMIC BASE

7. Recommendation: THAT THE TDC DETERMINE THE VALUE OF ADVANCED TELECOMMUNICATIONS AND INFORMATION SERVICES APPLICATIONS IN INDUSTRIES TARGETED FOR DEVELOPMENT BY ECONOMIC DEVELOPMENT OFFICIALS, IDENTIFY BARRIERS TO REALIZING THAT VALUE, AND PROPOSE ACTION BY THE TELECOMMUNICATIONS INDUSTRY AND GOVERNMENT TO OVERCOME THOSE BARRIERS.

Many of the same principles that apply to using advanced telecommunications for revitalizing Montana's existing basic industries also apply to diversifying into new businesses.

One example of diversification that has been pursued in several states is office-industry development. Office industries are defined as those in which most of the work takes place in offices, and include transportation services (shipping & travel agencies), communications, finance, insurance, real estate, business services, legal services, membership organizations and telemarketing services. Collecting, processing, analyzing and communicating information are important functions in office industries. One well-known example of office-industry development in a rural state is the CitiBank credit card processing facility in Sioux Falls, S.D.

Montana already has a prominent example of an information-intensive, office-industry firm in operation, Metropolitan Analysis and Research (MARS) of Missoula. This company moved to Montana in 1982 from Dallas. Aside from the owners' personal preference, the firm moved to Missoula to achieve cost savings. The owners estimate that the relocation to Montana cut the firm's operating expense by about 30 percent.

MARS' principal clients are companies such as Sears. The company conducts telephone interviews which qualify their clients' prospective employees for the federal tax credits which are available for hiring certain disadvantaged citizens. MARS employs 90 people in Missoula between two divisions located there.

MARS is very telecommunications intensive, using about 110 WATS lines for calls coming in and going out of Montana. It is a prime example of economic diversification made possible by the availability of advanced telecommunications. MARS' executives report that the telecommunications services they receive are ade-

quate, but could be better. They report a significant drop in decibels because of the number of switches their calls go through getting from Missoula to distant clients. This loss in decibels causes delays in completing interviews and thus affects their costs. Businesses like MARS can operate in Montana, but they find anything less than excellent telecommunications a barrier to the productivity and quality of their work.

The upcoming implementation of the U.S.-Canada free trade agreement may provide other opportunities for economic diversification. Alberta is economically and geographically similar to Montana. Montana should explore the possibilities of economic cooperation that could be facilitated by cross-border telecommunications, with leadership provided by the 49th Parallel Institute. As an example, the Province of Alberta has developed an educational network using satellite transmission. Their network may provide a market for educational programming produced by the Montana University system or the educational materials production firms that spin off from our universities.

VII. SUPPORT OF SMALL BUSINESS AND ENTREPRENEURSHIP

The birth and growth of small firms will likely be an important source of economic diversification in Montana. One obstacle to entrepreneurship in a sparsely populated state like Montana is the lack of a number of similar firms located in one area. Another is lack of support for entrepreneurship. People starting businesses tend to feel isolated from sources of assistance.

Advanced telecommunications provides an opportunity for some relief of isolation. For example, there are several national computer networks that provide a vehicle for information sharing, and a model for possible Montana-based networks. The Compuserve network, available to those with a personal computer and modem via a telephone call to one of Montana's six largest cities, offers a National Entrepreneurs Network, and a Working-from-Home Forum. The Compuserve service and others provide the ability to search hundreds of databases for business-related information, such as market intelligence.

In Montana, the Big Sky Telegraph, a computer-based information system located in Dillon, is planning to provide electronic communications for technical assistance to home-based businesses.

Electronic services — some of which offer a high level of personal, one-on-one communications between like-minded participants — can provide a sense of community for the rural entrepreneur. Urban areas like Seattle, Denver and Minneapolis have entrepreneurs' clubs, which meet monthly to hear speakers and allow members to share experiences. Telecommunications make such a club possible in Montana. Though Montana's club would offer less frequent face-to-face meetings, there could be very frequent contact through telecommunications.

One of the industry support centers we recommend be established in Montana by the telecommunications industry could be focused on the needs of small (under 10 employees) firms. The small business telecommunications support center could serve the function of building Montana business owners' awareness of and demand for telecommunications services.

VIII. EDUCATION AND ECONOMIC DEVELOPMENT

Education is the foundation of economic development efforts. The quality of K-12 through higher education in Montana should be of primary concern to our citizens.

The education system in Montana provides a source of quality workers, business assistance and research. The education system is critical to in-state and out-of-state firms who have a direct involvement with the economy of the state. A sound educational system helps assure the high quality of life that attracts business to the state.

Fortunately, the state begins from a relatively high base. Montana's high school graduation rate is ranked 8th highest in the nation. The level of both high school and college graduates is high relative to nation-wide averages, although below the average of the mountain states.

Telecommunications provides the door that opens enriching educational opportunities to all Montanans. The language classes in Plevina and post graduate courses in Great Falls, are examples of how Montana can use existing technology to enhance the quality of education our citizens receive.

K-12 public education

Montana law requires equal access to quality education across all parts of the state, wherever children live, no matter how sparse the population.

The challenge is great considering the vast size of the state (147,000 sq. miles), the relatively small population (800,000 est. 1987) and the large number of school districts (510). The Fiftyfirst Montana Legislature will be confronting the issue of equal educational opportunity, as a result of a successful legal challenge to the disparate funding of local education resulting from differing property values and varying local support across the state's 56 counties.

Telecommunications technology could help meet the equalization goal. Distribution of instructional programming through telecommunications —either video courses or computer-based instruction or other possibilities — could augment the present computer pattern of teachers standing in front of children. If the content of a "basic education" were defined, and if telecommunicated instructional resources were coordinated with the basic curriculum, these resources would be a way of filling gaps in local capabilities.

Public schools in Montana have begun to support K-12 instruction through telecommunications. For example, the Helena School District is offering certain classes through computers using ordinary phone lines. The Big Fork School District is offering foreign language classes through satellite transmission from Spokane. Plevina students are learning German via satellite transmission from Oklahoma. These are beginning efforts in using telecommunications to bring quality education to the most remote areas of the state.

8. **Recommendation:** THAT THE SUPERINTENDENT OF PUBLIC INSTRUCTION REVIEW THE ECONOMIC AND PROGRAMMATIC FEASIBILITY OF LOCAL EDUCATIONAL SERVICE DISTRICTS OR BOARDS OF COOPERATIVE EDUCATIONAL SERVICES AS A MEANS TO UTILIZE TELECOMMUNICATION TECHNOLOGIES FOR K-12 INSTRUCTION, STAFF DEVELOPMENT AND INFORMATION TRANSFER.

Some states call such regional centers Educational Service Districts (ESDs). These regional offices are supported by some public money and by the sale of services to the school districts. Services that are typically offered include legislative support, instructor support and class coordination.

The ESDs provide expertise to the school districts for staff development for rural schools. The ESD hires instructors for specific fields such as language or driver education. These instructors serve several school districts, which reduces the salary burden on all schools.

The ESD could be the coordinating element in the delivery of classes offered through the Rural Television System. It would be responsible for identifying the needs for a particular geographical area and providing access to that area for instructors from other parts of the state. The ESD would provide training to class room instructors on the video transmission of classes. The ESD could provide other services that are required to help

equalize education in Montana.

The Superintendent of Public Instruction could provide the framework for the development of this service by proposing legislation. The boundaries of the Montana Association of School Administrators provide natural boundaries for the ESDs. It is also recommended that other associations such as the Montana Association of Elementary and Middle School Principals and the Montana Association of Secondary School Principals adopt the same boundaries. This would insure that services were accurately identified and that problems created by conflicting boundaries would be avoided.

Higher education

9. Recommendation: THAT THE BOARD OF REGENTS APPOINT A TASK FORCE TO DEFINE OPPORTUNITIES FOR APPLYING TELECOMMUNICATIONS TO RAISE THE PRODUCTIVITY OF THE UNIVERSITY SYSTEM'S ADMINISTRATIVE FUNCTIONS.

The Montana Telecommunications Steering Committee supports the comprehensive management and academic evaluation of post-secondary education by an independent team as recommended by the Montana Ambassadors, and further recommends that such an evaluation include an assessment of telecommunications applications. The task force should identify certain programs and linkages that could be utilized by commercial interests in the state to promote economic development. We advocate neither centralization nor decentralization; we believe that telecommunications facilitates either, and that the most productive deployment of resources should be taken.

For example, Montana has six units in the University System. Each of these units has library and computer facilities. Electronic networks allow resource sharing between libraries and between computer centers. Perhaps certain kinds of resources should be consolidated, and others spread throughout the six units. In any event, telecommunications supports remote access from any campus to resources wherever they are physically located. This potential should be fully recognized by a telecommunications task force.

Through HJR 58, the Montana Legislature requested the Commissioner of Higher Education to establish a task force to study and coordinate the implementation of telecommunications and technology-based delivery systems for education, government and the private sector. Federal Engineering of Fairfax, Va, has been retained to provide an engineering study of the existing video network and to make recommendations on what hardware may be required to complete the network. This effort is being financed through contributions from U.S. West, Entech (Montana Powers'non-utitlity subsidiary), the Montana Ambassadors, the Department of Administration, the Office of Public Instruction and the Office of Higher Education.

10. Recommendation: THAT THE HJR 58 NETWORK DEVELOPMENT BE TAKEN AS AN OPPORTUNITY TO EXTEND TO THE GREATEST EXTENT POSSIBLE MONTANA'S EXISTING PRIVATELY PROVIDED, INFRASTRUCTURE AND SERVICES.

This course would make better public policy than creating a single-purpose, publicly owned and operated network for educational delivery. In other words, the HJR 58 effort could result in the further development of a robust, multi-purpose public telecommunications network available at reasonable prices for the economic development of all Montana individuals and organizations. To avoid unnecessary government capital investment in a university-owned telecommunications plant, solicitation of offers of participation by all available private-sector telecommunications service providers should be sought. This policy will allow the state to use the same telecommunications capability available to the private sector. Under these conditions, we urge the Montana Legislature to provide the necessary funds to support this network.

Along the lines of HJR 58, attention should be given to the telecommunications-supported expansion of educational and training services beyond the campus to new constituencies. An example is provided by Western Montana College's Big Sky Telegraph for K-12 education professionals and economic development officials. Big Sky Telegraph is a computer-based electronic service operating over ordinary voice-grade telephone lines to personal computers with modems. Through the service, rural educators can share information with each other. At present, about 100 schools use the service. Western Montana College supports the service with grants from the J.J. Murdock Charitable Trust and the U.S. West Foundation. The Big Sky Telegraph system administrators have plans to extend access to 15 states.

The expansion of higher education services to new constituencies including the brokering of out-of-state resources, such as the National Technological University (NTU), should be considered. The National Technological University was accredited in November 1986 by the Commission on Institutions of Higher Education. The school has 24 participating universities in 21 states able to broadcast live, interactive courses through the use of satellite uplinks. The university offers a wide range of credit and non-credit programs focused on the needs of technical professionals employed by corporations and federal agencies. NTU has access to over 3,500 engineering and computer science faculty. This capability would offer valuable continuing education opportunities to Montana's professionals.

Montana universities could also gain revenue and visibility by exporting educational and training services in their areas of strength, such as mining technology and environmental management.

Turning to graduate degree programs, three Montana institutions of higher education provide postgraduate programs in the technical and scientific disciplines: Montana State University (MSU) in Bozeman, Montana College of Mineral Science and Technology (Tech) in Butte, and University of Montana (UM) in Missoula. Included in the postgraduate programs in scientific and technical fields offered at Montana's universities are: Computer Science M.S., Ph.D, Electric & Electronic Engineering M.S., Ph.D. In 1983, the system granted 173 bachelors degrees and 29 postgraduate degrees in renewable and natural resources. At the same time, only 57 bachelors degrees and four advanced degrees were granted to computer and information services. In 1986, the postgraduate students in the information sciences increased to nine. Since information technology is becoming so critical to all industries within the modern economy, we urge that in upcoming strategic planning for the teaching emphasis of the state university system, consideration be given to programs that would increase the number of undergraduate and postgraduate students in the computer and information sciences.

IX. SUPPORT OF STATE AND LOCAL GOVERNMENT

The quality of state and local government services is a major contributor to quality of life, and to the business climate. Efficiency and effectiveness in government services are important.

11. Recommendation: THAT THE GOVERNOR ESTABLISH AN INTERAGENCY TASK FORCE INCLUDING ALL STATE DEPARTMENTS AND OFFICES TO REVIEW ADDITIONAL OPPORTUNITIES FOR INCREASING STATE GOVERNMENT'S EFFICIENCY AND EFFECTIVENESS THROUGH TELECOMMUNICATIONS AND INFORMATION SERVICES.

As an example of a potential application with economic development implications, consider the possibility of a statewide job network linking employment service offices. Those seeking the assistance of the state in finding employment would not be limited to inquiring from the staff of a particular unemployment office during office hours. With a voice-output database available through push-button telephones, or perhaps a database available on easy-to- use terminal screens in shopping malls, job opportunities throughout the state would be accessible for many more hours of the week in many more locations. The database could even be scrolled across the screen on cable TV channels in the middle of the night, an approach that has proven highly successful in England. With any or all of these telecommunications-based information distribution techniques, the matching of job seeker and job would be greatly enhanced. Paper-work would also likely be reduced.

12. Recommendation: THAT THE DEPARTMENT OF COMMERCE SUPPORT AN ELECTRONIC INFORMATION SERVICE PROVIDING COMMUNICATIONS AND DATABASE RETRIEVAL FOR COMMUNITY-LEVEL ECONOMIC DEVELOPMENT AGENCIES.

This network would facilitate area-and state-wide cooperation. A beginning effort that should be encouraged is the Headwaters Network, created by modifying Western Montana College's Big Sky Telegraph. Headwaters is a non-profit organization providing centralized data base for economic development information on seven southwestern counties in Montana. While creating a seven-county economic development program, Headwaters recognized the need to access information on a local basis and to share that information regionally. Economic development efforts in small towns would be enhanced if individuals in those towns were able to access data bases with the same ease as users in larger cities.

Government Telecommunications

Changing focus, it is worth noting that the State of Montana has become a provider of basic telecommunications service for state government agencies. The state has a lease/purchase agreement for a micro-wave system that serves long-distance transmission from Helena to Bozeman. This service was formerly provided by A.T.&T.

The State of Montana, through the Department of Administrations' Telecommunications Bureau, is providing voice and data transmission services to agencies of state government on owned and leased lines. The university system, through the HJR 58 Task Force, is studying the potential of owning or leasing video transmission in Montana with the possibility of selling excess capacity to the private sector. With these developments comes the issue of by-passing the existing network.

The state is the largest telecommunications user in Montana. The public network is supported by all consumers of service through the rate setting authority of the Public Service Commission. When a large user, public or private, sets up its own network, the remaining consumers must bear the costs of maintaining the system. The issue of allowing the state to by-pass the public network should be given serious consideration in light of its potential affect on modernization decisions and cost to the remaining consumers.

An extreme case of revenue diversion would result from a government agency providing telecommunications service to present customers of telecommunications companies. This could happen if state government were to provide service to counties and municipalities, or if the universities were to provide service to local public schools. The effects of service arrangements of this kind need to be explored very carefully before being undertaken.

No conclusion is drawn here that the price or performance of Montana's public network is being damaged by the past, present or planned actions of the state government, but that potential exists. Nor is it concluded that state government should necessarily leverage its telecommunications purchasing power to achieve modernization of Montana telecommunications. However, this option is important and should be considered.

Optimizing the cost and performance of the state government's telecommunications system represents a public policy decision. The implications of this choice, the effects on the non-government users of telecommunications and the possibility of other choices, should be understood in the context of economic development.

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